IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	10/723,075
Inventor(s)	:	Mukundan et al.
Filed	:	11/25/2003
Art Unit	:	1753
Examiner	:	S. Vathyam
Docket No.	:	S-102,315
Confirmation No.	:	8636
Customer No.	:	35068
Title	:	MIXED-POTENTIAL HYDROCARBON SENSOR WITH LOW SENSITIVITY TO METHANE AND CARBON MONOXIDE

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

This Brief is filed pursuant to the appeal from the decision communicated in the Office Action mailed on December 10, 2007.

A Notice of Appeal is being submitted together with this brief.

CERTIFICATE OF MAILING/TRANSMISSION (37 CFR 1.8(a))

I hereby certify that this correspondence is, on the date shown below, being:

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☐ deposited with the United States Postal Service to the United States Patent and Trademark Office on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450.	☒ Transmitted by facsimile to the United States Patent and Trademark Office.

Date January 15, 2008

Signature

Juliet A. Jones

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Docket No. S-102,315
In Response to Office Action dated 12/10/2007

REAL PARTY IN INTEREST

The real party in interest in the present Appeal is the assignee, Los Alamos National Security, LLC, at Los Alamos National Laboratory.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals, interferences, or judicial proceedings.

STATUS OF CLAIMS

Claims 1 to 4 stand rejected by the Examiner as noted in the Advisory Action mailed on December 10, 2007. Claims 5-11 have been previously canceled. The rejection of claims 1-4 is appealed.

STATUS OF AMENDMENTS

No amendment was filed.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 relates to a hydrocarbon sensor (specification, p. 4, lines 26-27) comprising an electrolyte body having a first electrolyte surface (specification, p.8, lines 11-13 and Figure 1A (10)) with a reference electrode depending therefrom (specification page 6, lines 8-9 and Figure 1A (16); a metal oxide electrode body contained within the electrolyte body (specification, page 8, lines 12-13 and Figure 1A (12)) and having a first electrode surface coplanar with the first electrolyte surface (Figure 1B, (10), (12)), wherein the electrolyte body is compressed and sintered about the metal oxide electrode body for intimate contact therebetween (specification, page 5, line 29 – page 6, line 2 and Figure 1A (10), (12)).

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GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Rejection of claims 1-3 under 35 U.S.C. 103(a) over U.S. Patent 4,277,323 (Muller et al.) in view of U.S. Patent 5,028,404 (Carberry et al.)

2. Rejection of claim 4 under 35 U.S.C. 103(a) over U.S. Patent 4,277,323 (Muller et al.) in view of U.S. Patent 5,028,404 (Carberry et al.) in further view of U.S. Patent 4,755,274 (Mase et al.)

3. Rejection of claims 1-3 under 35 U.S.C. 103(a) over U.S. Patent 5,543,025 (Garzon et al.) in view of U.S. Patent 5,028,404 (Carberry et al.).

4. Rejection of claim 4 under 35 U.S.C. 103(a) over U.S. Patent 5,543,025 (Garzon et al.) in view of U.S. Patent 5,028,404 (Carberry et al.) in further view of U.S. Patent 4,755,274 (Mase et al.)

ARGUMENTS

1. Rejection of claims 1-3 under 35 U.S.C. 103(a) over U.S. Patent 4,277,323 (Muller et al.) in view of U.S. Patent 5,028,404 (Carberry et al.)

Applicants argue hereby the patentability of claim 1; claims 2 and 3 stand or fall with claim 1. Applicants' Claim 1 is directed toward a hydrocarbon sensor, and requires an electrolyte body having a first electrolyte surface with a reference electrode depending therefrom; a metal oxide electrode body contained within the electrolyte body and having a first electrode surface coplanar with the first electrolyte surface, wherein the electrolyte body is compressed and sintered about the metal oxide electrode body for intimate contact therebetween [emphasis added].

The Examiner admits that Muller fails to disclose the electrode to be a metal oxide (Office Action of October 24, 2007, page 3), and asserts that it would have been obvious

to one of ordinary skill in the art to have substituted the metal electrode of Muller with the metal oxide of Carberry.

As pointed out by the Examiner in the Office Action of October 24, 2007 (page 7), the U.S. Supreme Court noted in *KSR v. Teleflex* that the obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion and motivation. 127 S. Ct. 1727, 1742. The Court further noted, however, that "[a]lthough common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, *it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. Id* at 1741 [emphasis added]. Applicants assert that one of skill in the art would have no reason to combine the teachings of Carberry and Muller.

As Applicants explained on page 4 of the Response to the Office Action of June 27, 2007, assuming for the sake of argument only that the metal oxide of Carberry were substituted for the metal electrode of Muller, this would not result in Applicants claimed invention. Claim 1 of Applicants' invention is directed toward a hydrocarbon sensor. Carberry teaches metal oxide as a viable alternative to noble metal catalysts. (Carberry, Abstract and col. 1, line 58 – col. 2, line 7.) Muller teaches an oxygen sensor. The sensor in Muller is applied to one surface of an insulated carrier plate or substrate. (Muller, Col. 1, lines 65-68.) The carrier plate is an essential element of Muller's invention, is pervious to oxygen molecules (porous), and the oxygen molecules pass through the substrate to reach the electrodes. (Muller, Col. 2, lines 3-7.) Whereas such a construct may work for oxygen molecules, which are relatively stable, this would not allow detection of hydrocarbons. As is explained on page 2, line 24 through page 3, line 3 of the Applicants' specification, when a hydrocarbon is forced to meander through pores of a material, it may be catalyzed in the presence of oxygen to non-hydrocarbon products. This reduces sensitivity. Thus, as one of skill in the art would understand, an electrode with a high catalysis rate would not be desirable in a *hydrocarbon* sensor, because the sensed gas concentration would be diminished by catalysis as the gas diffuses towards the surface.

In response, the Examiner states that Applicants' assertion that "catalysis is undesirable in sensors does not correspond with the breadth of the claim, which is open to sensors with or without catalysis." In support of this statement, the Examiner states that "Muller ('323) explains that sensors may or may not involve catalysis at an electrode," citing column 5, lines 7-12. See Advisory Action of December 10, 2007. Applicants believe that these statements are misleading for the following reasons. First, Applicants claims are not directed toward a sensor in general, but toward a hydrocarbon sensor. As stated in the previous paragraph, Applicants provide ample support in the specification as to why catalysis is undesirable in a hydrocarbon sensor. Second, column 5, lines 7-12 of Muller '323 in fact states: "In this case, one of two electrodes 30, 31 must be arranged that it can catalyze the gas equilibrium. This can be one porous platinum electrode, as used also in a polarographic sensor." This is different than the assertion that "sensors may or may not involve catalysis at an electrode," as Muller is referring to catalyzing an equilibrium. It is also irrelevant to Applicants' Claim 1. Whereas some sensors may involve catalysis, Applicants' claim is directed toward a hydrocarbon sensor, in which Applicants have explained that catalysis is undesirable.

In summary, because Muller teaches a construction unsuitable for a hydrocarbon sensor, and Carberry teaches use of a metal oxide for catalysis, one of skill in the art would have no motivation to combine Muller with Carberry or with any other reference. Furthermore, the combination would not result in Applicants' claimed invention. For these reasons, Applicants believe that the rejection under 35 U.S.C. 103(a) is improper.

2. Rejection of claim 4 under 35 U.S.C. 103(a) over U.S. Patent 4,277,323 (Muller et al.) in view of U.S. Patent 5,028,404 (Carberry et al.) in further view of U.S. Patent 4,755,274 (Mase et al.)

Claim 4 depends from claim 1, and includes a further limitation "where the electrolyte body is yttria stabilized zirconia with a porosity produced by sintering at a temperature effective to produce a density less than about 81% of theoretical maximum density." The Examiner asserts that it would have been obvious to stabilize the zirconia electrolyte body of Muller with yttria as taught by Mase and to produce a desired porosity of the electrolyte body by sintering as taught by Mase.

Because claim 4 depends from claim 1, the arguments set forth above in subheading 1 with respect to claim 1 apply here. Because one of skill in the art would have no motivation to combine Muller and Carberry, there would similarly be no motivation to combine Muller and Carberry with Mase. In addition, Mase teaches the use of a porous ceramic layer (see *inter alia* Mase, Col. 2, lines 40 – 43) and fails to teach an electrode body contained within the electrolyte body and having a first electrode surface coplanar with the first electrolyte surface. Thus, even if these references were combined, the combination would fail to result in Applicants' invention reflected in claims 4 and claim 1 from which claim 4 depends. For these reasons, this rejection under 35 U.S.C. 103(a) is improper.

3. Rejection of claims 1-3 under 35 U.S.C. 103(a) over U.S. Patent 5,543,025 (Garzon et al.) in view of U.S. Patent 5,028,404 (Carberry et al.).

Applicants argue hereby the patentability of claim 1; claims 2 and 3 stand or fall with claim 1. The Examiner rejects claims 1-3 under 35 U.S.C. 103(a) over Garzon in view of Carberry. The Office Action admits that Garzon fails to disclose a metal oxide electrode, but that Carberry teaches a metal oxide as a viable alternative to noble metal catalysts, and that it would have been obvious to substitute the metal electrode of Garzon with the metal oxide of Carberry.

The combination of Garzon with Carberry would fail to result in Applicants' claimed invention. Applicants' claim 1 requires a first electrode surface coplanar with the first electrolyte surface, which is not taught by Garzon or by any of the other cited references. In the Office Action of October 24, 2007, page 8, nr. 12, the Examiner rejects this assertion, stating that Fig. 2 of Garzon depicts the mixed conductor 34 as being coplanar with the electrolyte. Applicants believe this to be in error, however. Close inspection of Figure 2 of Garzon depicts a mixed conductor 34 that is non-coplanar with the electrolyte 32, and wherein the electrolyte is deposited onto the conductor layer rather than the electrode body being contained within the electrolyte body. See Garzon, col. 3, lines 26-37. Figure 2 further depicts an oxygen sensor in which the oxygen must pass through a porous substrate (Garzon, col. 3, lines 32-33). As Applicants described in subheading 1, whereas having a sample pass through a porous substrate may be suitable for an oxygen detector, such a device would not be useful for detecting hydrocarbons.

Thus, one of skill in the art would have no motivation to look to the teachings of Garzon to produce a hydrocarbon sensor.

In addition, Carberry teaches metal oxides for use in catalysts, i.e., to convert one chemical species to another in exhaust gases. As explained in subheading 1 above, catalysis is undesirable in a hydrocarbon sensor. As one of skill in the art would understand, a hydrocarbon electrode with a high catalysis rate would not be desirable because the sensed gas concentration would be diminished by catalysis. In contrast, in contrast to catalysis, the present invention comprises both a sensor and a reference electrode and detects *differences* in the electrochemical reaction rates.

In the Office Action of October 24, 2007, page 7, last paragraph, the Examiner rejected this argument, asserting that "the claims do not require any step of detecting a difference or of detecting a reaction rate and aren't even method claims." However, claims must be read in light of the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Applicants point out that the present claims require an electrode and a reference electrode. As one of ordinary skill in the art would understand, when an electrode and a reference electrode are present, there is detection of a difference in current, which in turn relates to the reaction rate. See page 2, paragraph 2 of the specification. Thus, a function of the claimed article is to detect differences in reaction rates. Applicants further explain on page 9, Table 1 and lines 5-15 that response time is measured in terms of the voltage difference between the first electrode and the reference electrode.

In the Advisory Action of December 10, 2007, the Examiner rejected this argument, stating that limitations from the specification are not read into the claims, and citing *In re Van Geuns*, 988 F.2d 1181, 26 U.S.P.G. 2d 1057 (Fed. Cir. 1993). Applicants believe, however, that the Examiner's reliance on this case is misplaced. Applicants are not asking that limitations be read into the claims; rather, the limitations are already present in the claims, and are clarified in the specification, which relates differences in current to differences in reaction rates. In *In re Van Geuns*, the invention was an NMR or MRI imaging instrument. A claim was directed toward a magnet assembly with a

uniform magnetic field. *Id.* At 1184. The prior art disclosed a magnet assembly with a substantially uniform field, varying no more than 10%. Van Geuns argued that the reference did not render his NMR instrument obvious, because it does not teach the level of magnetic field uniformity required for NMR imaging. However, the claim was not specifically directed toward an NMR or MRI instrument. Van Geuns argued that the claim must be read in light of the specification, which disclosed such instruments, and the court disagreed. This is different than Applicants Claim 1, which requires an electrode and a reference electrode, and thus would inherently measure a difference in current.

Because neither Garzon nor Carberry teach a first electrode surface coplanar with the first electrolyte surface, and Carberry teaches the substitution of a metal oxide for use in a catalyst, one of skill in the art would have no motivation to combine the references, and furthermore, the combination of references would not result in Applicants' claimed invention. For this reason, the rejection under 35 U.S.C. 103(a) is improper.

4. Rejection of claim 4 under 35 U.S.C. 103(a) over U.S. Patent 5,543,025 (Garzon et al.) in view of U.S. Patent 5,028,404 (Carberry et al.) in further view of U.S. Patent 4,755,274 (Mase et al.)

Claim 4 depends from claim 1, and includes a further limitation "where the electrolyte body is yttria stabilized zirconia with a porosity produced by sintering at a temperature effective to produce a density less than about 81% of theoretical maximum density." The Examiner asserts Mase teaches a sensor comprising an yttria stabilized zirconia electrolyte body with a desired porosity for gas diffusion and measurement produced by sintering, and thus it would be obvious to combine Mase with Garzon and Carberry to arrive at Applicants' claim 4.

Because claim 4 depends from claim 1, the arguments set forth above in subheading 3 with respect to claim 1 apply here. Applicants believe that for these reasons one of skill in the art would have no reason to combine Garzon with Carberry to arrive at the invention of claim 1. In addition, Mase fails to teach an electrode body contained within the electrolyte body and having a first electrode surface coplanar with the first electrolyte surface. Thus, the combination of references would fail to produce Applicants' invention, and thus this rejection under 35 U.S.C. 103(a) is improper.

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Docket No. S-102,315
In Response to Office Action dated 12/10/2007

SUMMARY

In view of the arguments presented herein, it is respectfully submitted that the rejections under 35 U.S.C. 103(a) are improper.

Respectfully submitted,

Date: January 15, 2008

Signature of Attorney

Reg. No. 54,202
Phone (505) 606-2235

Juliet A. Jones, Ph.D.
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SN 10/723,075
Docket No. S-102,315
In Response to Office Action dated 12/10/2007

CLAIMS APPENDIX

1. A hydrocarbon sensor comprising:

an electrolyte body having a first electrolyte surface with a reference electrode depending therefrom;

a metal oxide electrode body contained within the electrolyte body and having a first electrode surface coplanar with the first electrolyte surface, wherein the electrolyte body is compressed and sintered about the metal oxide electrode body for intimate contact therebetween.

2. The hydrocarbon sensor according to Claim 1, where the metal oxide electrode body is formed from $La_{1-x}A_xCrO_3$, where A is selected from the group consisting of Sr, Ca, and Mg, and $0 \leq x \leq 0.5$.

3. The hydrocarbon sensor according to Claim 2, where A is Sr and x=0.2.

4. The hydrocarbon sensor according to Claim 1, where the electrolyte body is yttria stabilized zirconia with a porosity produced by sintering at a temperature effective to produce a density less than about 81% of theoretical maximum density.

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EVIDENCE APPENDIX

NONE

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RELATED PROCEEDINGS APPENDIX

NONE

Rev 06/04/04

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Rangachary Mukundan	Docket No.:	S-102,315
Serial No.:	10/723,075	Examiner:	S. Vathyam
Filed :	11/25/2003	Art Unit:	1795

For : MIXED-POTENTIAL HYDROCARBON SENSOR WITH LOW SENSITIVITY TO METHANE AND CARBON MONOXIDE

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Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

1. Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on December 10, 2007.

2. Attached is a Fee Transmittal Form.

Respectfully submitted,

Date: January 15, 2008

Signature of Attorney

Reg. No. 54,202
Phone: (505) 606-2235

Juliet A. Jones
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Rev. 02/02/06

FEE TRANSMITTAL
For FY 2007

Patent fees are subject to annual revision

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT: $255.00

Complete If Known	
Application Number:	10/723,075
Filing Date:	11/25/2003
First Named Inventor:	Rangachary Mukundan
Examiner Name:	S. Vathyam
Group/Art Unit:	1753
Attorney Docket No.:	S-102,315

METHOD OF PAYMENT (check all that apply)

1. ☒ The commissioner is hereby authorized to charge indicated fees and credit any over payments to:
   Deposit Account Number: **12-2150**
   Deposit Account Name: **Los Alamos National Laboratory**
   ☒ Charge Any Additional Fee Required Under 37 C.F.R. 1.16 and 1.17

FEE CALCULATION

1. COMBINED FILING FEE

Large Entity Fee		Small Entity Fee		Fee Description	Fee Paid
1001	$310	2001	$155	Basic Filing fee	$0.00
1004	$310	2004	$155	Reissue Filing fee	$
1111	$510	2111	$255	Search Fee	$0.00
1311	$210	2311	$105	Examination Fee	$0.00
1005	$210	2005	$105	Provisional Filing Fee	
1085	$260	2085	$130	Provisional Size Fee	

(for each additional 50 sheets that exceeds 100 sheets)

SUBTOTAL (1) $0.00

2. EXTRA CLAIM FEES/APPLICATION SIZE FEE

		Extra Claims		Fee from Fee Paid Below
Total Claims	-20** =	X	=	$
Independent Claims	-3 ** =	X	=	$
Multiple Dependent		X 180		= $

*** or number previously paid, if greater; For Reissues, see below*

Large Entity Fee		Small Entity Fee		Fee Description
1202	$50	2202	$25	Claims in excess of 20
1201	$210	2201	$105	Independent claims in excess of 3
1203	$370	2203	$185	Multiple dependent claim, if not paid.
1204	$200	2204	$100	Reissue independent claims in excess of 3 over original patent
1205	$50	2205	$25	Reissue claims in excess of 20 over original patent

Total Claims Fee $ 0.00

APPLICATION SIZE FEE

1081 $260 2081 $130.00 For each additional 50 sheets that exceed 100 sheets, including specification and drawings

SUBTOTAL (2) $ 0.00
(Include total of Claims Fees and Size Fee here)

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee	Large Entity Fee ($)	Small Entity Fee	Small Entity Fee ($)	Fee Description	Fee Paid
1051	$130	2051	$65	Surcharge – late filing fee or oath	
1052	$50	2052	$25	Surcharge – late provisional filing fee or cover sheet	
1812	$2520	1812	$2520	For filing a request for reexamination	
1251	$120	2251	$60	Extension for reply within first month	
1252	$460	2252	$230	Extension for reply within second month	
1253	$1050	2253	$525	Extension for reply within third month	
1254	$1640	2254	$820	Extension for reply within fourth month	
1255	$2230	2255	$1115	Extension for reply within fifth month	
1401	$510	2401	$255	Notice of Appeal	
1402	$510	2402	$255	**Filing a brief in support of an appeal**	$255.00
1403	$1030	2403	$515	Request for oral hearing	
1452	$510	2452	$255	Petition to revive – unavoidable	
1814	$110	2814	$55	Terminal Disclaimer	
1453	$1540	2453	$770	Petition to revive – unintentional	
1460	$130	1460	$130	Petitions to the Director	
1806	$180	1806	$180	Submission of Information Disclosure Statement	
1809	$810	2809	$405	Filing a submission after final rejection (37 CFR 1.129 (a))	
1810	$810	2810	$405	For each additional invention to be examined (37 CFR 1.129(b))	
1811	$100	1811	$100	Certificate of Correction	
1504	$300	1504	$300	Publication fee for early, voluntary, or normal publication/Republication fee	
1801	$810	2801	$405	Request for Continued Examination (RCE)	

Other fee (specify) _____

SUBTOTAL (3) $255.00

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SUBTOTAL FROM 1 $ 0.00
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SUBTOTAL FROM 3 $ 255.00

TOTAL AMOUNT OF PAYMENT $ 255.00
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SUBMITTED BY			Complete (if applicable)	
Printed Name:	Juliet A. Jones		Reg. No.	54,202
Signature:		Date: January 15, 2008	Telephone	(505) 606-2235